ADOPTION AND USE OF INTERNET OF THINGS (IOT) BY SMALL AND MEDIUM ENTERPRISE FOR TRADE IN EAST AFRICAN REGION

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ABSTRACT

Small and Medium Enterprises (SMEs) are some of the core elements involved in increasing levels of employment in East African region at large. However as competition from large national or international firms increases, which then result in a decrease in prices, customer base or both continue hurt the growth of SMEs and the whole economy. This is so because large firms adopt ICTs more swiftly hence digital divide. The adoption and use of appropriate Information Communication Technologies (ICTs) can help SMEs remain competitive. The aim of this paper is to conduct an empirical investigation to identify tangible benefits derived from the adoption and use of ICTs among SMEs in East African region. Its aim is to improve the understanding of the role ICTs can play in improving SMEs through better trade facilitation. Trade facilitation includes the simplification and harmonization of international trade procedures. The main findings of this study are that SMEs are still in the early stages in the use of ICTs in trade. Several factors were found to be responsible for this, including finance, employee education including ICT skills, high cost of ICT infrastructure and shortage of skilled human capital. Greater advocacy, awareness and facilitation for ICTs use and adoption are recommended.

Keywords: SMEs, ICTs, trade facilitation, simplification, harmonization, international trade procedures, internet.

1.0 Introduction

SMEs are defined as enterprises with fulltime employees not exceeding 100 or annual sales turnover not exceeding Ksh 150 million. According to K. L. Wanjau, 2010 development of competitive and resilient small and medium enterprises (SMEs) forms an integral component of East Africa's initiatives to be globally competitive and prosperous nations with a high quality.

SMEs play a major role in economic development in every country, including in African countries. Studies indicate that in both advanced economies and developing countries SMEs contribute on average 60 percent of total formal employment in the manufacturing sector (Ayyagari et al. 2007). For African economies, the contribution of the SME sector to job opportunities is even more important. Taking into account the contribution of the informal sector, SMEs account for about three-quarters of total employment in manufacturing (Ayyagari et al. 2007). This is directly connected to poverty. SMEs in developing countries are challenged by the globalisation of production and the change in the importance of the various determinants of competitiveness.

Information and Communication Technology (ICT) on the other hand, is identified as an enabler of other sectors, (GOK, 2007) presenting huge opportunities for SMEs and customers to improve market access. ICT is an essential tool in the highly globalized, knowledge economy. Some of the limitations facing SMEs include; limited resources to promote their products, poor quality products and poor market research. ICT can improve SMEs by facilitating communication with customers, competitive positioning, enable information acquisition and production of quality products, generation of market information, reduction in logistic costs, facilitating access to global markets, facilitating market research, market transactions and identification. All this trickles down to improved services to customers and reduced costs.

Internet of Things (IoT) is a collection of 'things' that have been embedded with electronics, software, sensors, actuators, and connected via the Internet to collect and exchange data with each other. IoT applications include smart homes, smart city, smart grids, medical and health care equipment, connected vehicles etc. The fast growth of the number of IoT devices utilized is predicted to reach 41 billion in 2020 with an $8.9 trillion market as stated in the 2013 report of the International Data Corporation (Wu, Yin, Li, Zhao 2017). IoT allow people and thing to be connected anytime, anyplace, with anything and anyone ideally using any path/network and any service. IoT promises to ensure all smart objects are connected to the Internet and communicate with each other with minimum intervention (Kumar, Patel 2014).

IoT relies on wireless networks which are prone to intrusions such as unauthorized router access, faulty configuration, jamming, man-in-the-middle attacks, interference, spoofing, Denial of Service attacks, brute-force attacks, traffic injections etc (Mendez, Ppapanagiotou, Yang 2017). Security system in these devices is not robust thus there's a potential risk of the large number of unsecured devices connected to the Internet. Security and privacy for IoT devices is a major concern which bring about online privacy concerns for the consumers. This is because the devices collect personal information like names and monitor user activities. This makes consumers to be wary of placing too much personal information in public or private clouds.

Information Security is an assurance function for the safety of information related to technology and the management of an organization. It should be everyone's duty (Humphreys, 2008). It can be defined as protecting it from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction. It also means safety or absence from danger. Cyber criminals are always evolving and inventing new ways of targeting vulnerable companies (Kigen

et al., 2015). Organizational stakeholders must come up with ways to protect data and guard against computer misuse while at the work place. An Information Security Culture will be valuable to all these stakeholders that depend on it (Calder & Watkins, 2008). Governance can be defined as exercising control or authority. With the development of technology, new attacking tools are being regularly developed. IoT is vulnerable to attacks (Weber & Weber, 2010: 41). This paper will look at the security of Internet of Things (IoT).

1.1 Objectives

The objectives of this paper:
1. To determine the extent of adoption of Internet of Things in trade by SMEs in East African region.
2. To determine whether Small and Medium Enterprises have the capacity to introduce and ensure adoption and use of Internet of Things.
3. To investigate the impact of adoption and use of Internet of Things by SMEs in the East African region.
4. To make recommendations for effective adoption of Internet of Things by SMEs in the East African region.

1.2 Theoretical Framework

This paper is based on Unified Theory of Acceptance and Use of Technology Model (UTAUT). UTAUT as developed by Venkatesh et al. (2003) has several constructs sets of factors from previous literature. It identifies the following four factors as the main determinant of user adaptation; performance expectancy, effort expectancy, social influence, and facilitating conditions.

- Performance expectancy is the degree to which an individual believes that using a particular system would improve his or her job performance.
- Effort expectancy is the degree of simplicity associated with the use of a particular system.
- Social influence: the degree to which an individual perceives that others believe he or she should use a particular system
- Facilitating conditions: the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular system
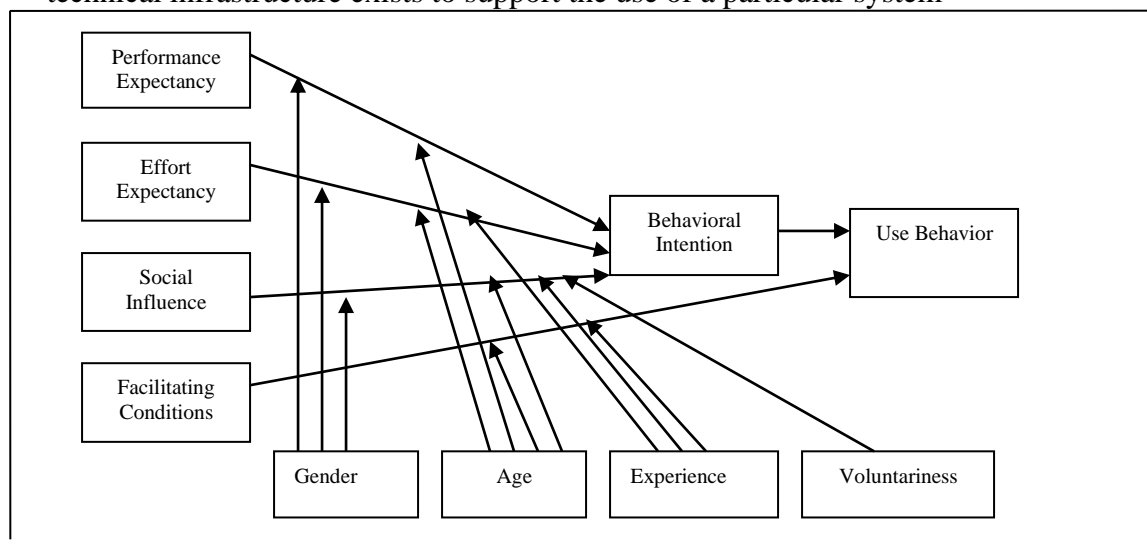

F*igure 1*. *UTAUT Model*: *Source*: Venkatesh et al, (2003)

2.0 Methodology

This study adopts an interpretative kind (Walsham, 1995) of exploratory study. The primary aim of the study is, through interpreting the implications caused by adoption of ICT by small medium enterprises. The paper aims at gathering data from key players in small and medium enterprises adopting a snowball strategy (Vogt 2008), explicitly ask the interviewees who else they recommend to talk to, as well as receiving the interviewees' spontaneous recommendations. The paper considers this design appropriate since it will facilitate gathering of reliable data.

2.1 Population Sampling

Target population is the entire set of units for which the study data are to be used to make inferences. It defines those units for which the findings of the study are meant to generalize (Dempsey, 2003).

The small and medium scale industries in our study include enterprises from three sectors: information technology, food processing and tourism. These three sectors as a whole make sizeable contribution to the growth domestic product of these countries. In evaluating information and communication technology induced performance of small and medium scale industries, we have considered three performance indicators: internal rate of return, labour productivity, and domestic and export market expansion.

Table1. People to be interviewed

Category	Population	Sample
Business Owners	10	3
I.T Managers	10	3
IT personnel	30	10
TOTAL	40	16

2.2 Sampling Design

Kothari (2004) suggests two alternative approaches for determining the size of a sample. The first approach is to specify the precision of estimation desired and then to determine the sample size necessary to insure it. The second approach uses Bayesian statistics to weigh the cost of additional information against the expected value of the additional information.

2.3 Research Instruments

Interview schedules were used for this research. The interview targets the Information Technology managers and business owners of the identified SMEs Kothari (2004). This is because the people who were interviewed are few and this makes use of interviews the best research instrument to use.

2.3.1 Data collection

In this paper, interviews were conducted so as to find out the adoption process and the decision behind it, the research is an exploratory research. Interviews can be done in different ways when it comes to research. Open ended, closed, standardized, general and informal interviews. We have chosen to gather most of our information and data in form of interviews

because it helps getting to actually talk to someone about a subject. It could be good to have some sort of other gathering method to get better reliability but interviews works as a good source. (Saunders et al. 2009).

The population of the study was the Kenyan top 100 medium sized companies which have turn over exceeding Kshs 70 million in the year ending December 2010 and have been in operation for over ten years (KPMG and Business Daily, 2011). 10 SMEs in Nairobi area were sampled which also have branches in the East African region. The data was analyzed using the statistical package for social sciences (SPSS).

3.0 Results

Ten different interviews were done with ten different small and medium enterprise, business owners and information technology managers. An analysis based on the strength, weakness, opportunities and threats was used to analyze the interview results;

STRENGTH	WEAKNESS
1) Access to information from any computer irrespective of geographical location. 2) Enhances easy communication between suppliers and customers.	1) Low internet connectivity in the region. 2) Poor infrastructures like lack of electricity in the rural areas. 3) Lack of enough technical skilled business people.
OPPORTUNITIES	THREATS
1) Allows the business people to get feedback from the clients or the customers. 2) The business men can easily interact with each other from different parts of the world.	1) Technological challenges 2) Privacy issues 3) Security issues

F*igure 2. SWOT analyses.*

4.0 Conclusions

Use of information communication technologies will therefore add value to Small medium enterprises. Small medium enterprises should be encouraged to use various forms of technologies like cloud computing, big data, virtualization and disaster recovery in order to achieve their business goals.

The SWOT analysis factors, addresses only internal factors and their influence on the business's behavior not taking into account the role that external variables can play in this context. In this sense and for future research, a PEST analysis is recommended, when studying the mix of internal and external factors concerning the adoption of information and communication technologies by SMEs.

The study confirms the efficiency of the UTAUT model despite the fact that it does not clearly address security concerns as a factor that discourages the adoption and use of ICT.

References

Ayyagari, M., T. Beck, and A. Demirgüç-Kunt, 2007. "Small and Medium Enterprises across the Globe", Small Business Economics 29, 415–434.

Calder, A., & Watkins, S. (2008). *IT governance: A manager's guide to data security and ISO 27001/ISO 27002*. Kogan Page Ltd.

Dempsey, B. (2003).*Research Methods, Fourth Edition*, Pearson Publishers.

Government of Kenya (2007). *Kenya Vision 2030: "A Globally Competitive and Prosperous Kenya"*. Nairobi: Government Printers.

K. L. Wanjau, R. W. (2010). *The Role Of Quality In Growth Of Small And Medium Enterprises And Economic Development In Kenya*.

Kigen, P. M., Muchai, C., Kimani, K., Mwangi, M., Shiyayo, B., Ndegwa, D., & Shitanda, S. (2015). *Kenya Cyber Security Report 2015*. Serianu Limited.

Kothari C. R. (2004). *Research Methodology: Methods and Techniques (2nd Edition.).* New Age International Publishers Ltd, Delhi.

Kothari, C.R. (2003). *Research methodology: Methods & techniques.* First Edition, New Age International Publishers.

Kumar J. Sathish, Patel Dhiren R. (2014). A survey on internet of things : security and privacy issues. *International Journal of Computer Applications(0975-8887) Vol 90 – No 11.*

KPMG and Business Daily. (2011). *Kenya Top 100 Mid- Sized Companies SUrvey 2011*. Nairobi: Daly Nation.

Levy, M. (2009). *An exploration of the role of information systems in developing strategic growth in small and medium-sized enterprises.* University of Warwick, Warwick.

Mendez Diego, Papapanagiotou, Yang Baijian (2017). *Internet of things: survey on security and privacy.*

Morris, S. (2001) *Data analysis methods: Third Edition*; Pearson Publishers.

Republic of Kenya (2005). *Policy Analysis and Planning for Micro and Small Medium Enterprises*. Kenya.

Saunders Mark, Lewis Philip & Thornhill Adrian. (2009) *Research Methods for Business Students*. Prentice Hall.

VENKATESH, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View, *MIS Quarterly,* 27(3): 425-478.

White Paper on International Development. (2000). *Eliminating World poverty Making Globalization Work for the Poor* . London: Stationary office.